UNIVERSITI TEKNOLOGI MARA

DYNAMICAL FUZZY AUTOCATALYTIC SET OF COMBUSTION PROCESS IN CIRCULATING FLUIDIZED BED BOILER USING TRANSITION MATRIX

HAZWANI BINTI HASHIM

Dissertation submitted in partial fulfilment of the requirements for the degree of
Master of Science

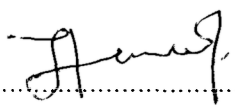
Faculty of Computer and Mathematical Sciences

January 2014

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This dissertation has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

Name of Student	:	Hazwani Binti Hashim
Student I.D. No.	:	2012746323
Programme	:	Master of Science (Applied Mathematics)
Faculty	:	Computer and Mathematical Sciences
Dissertation Title	:	Dynamical Fuzzy Autocatalytic Set of Combustion Process in Circulating Fluidized Bed Boiler Using Transition Matrix
Signature of Student	:	
Date	:	January 2014

ABSTRACT

A chemical reaction occurring during combustion process in circulating fluidized bed boiler (CFB) has been modeled using concept of Fuzzy Autocatalytic Set (FACS) of fuzzy graph type-3 whereby fifteen important species identified in the process are represented as nodes and catalytic relationship among the species are represented by fuzzy edges in the graph. A study has been conducted to explain dynamical behaviour of the species during the combustion process by using Perron-Frobenious eigenvector of adjacency matrix as an indicator for the concentration of species at certain time t. However the result reveals that by-product of the process is not in accordance to the real process. Thus, this study is carried out to investigate further the dynamical nature of the process using alternative matrix representation of FACS namely transition matrix of FACS. Here, specific transition matrix of FACS in CFB is developed and its basic properties which relates to Perron-Frobenius theorem are investigated. The development of an algorithm to calculate left Perron vector or steady state vector of the transition matrix is required in order to investigate dynamical behaviour of the system through graph dynamics of FACS. Thus it leads to the establishment of an improvised Graph Dynamics Algorithm which is used to assist the analysis of graph dynamics of FACS in CFB. The improvised GDA is able to reduce computer running time as compared to previous algorithm and able to deals with a sparse graph. Implementation of the algorithm to graphical FACS model of CFB shows that it is able to better explained the combustion process in terms of depletion species over time t and important species which denotes as by-product of the combustion is shown to be in accordance to the real process. Thus transition matrix of FACS of CFB is able to give better interpretation of combustion process in CFB as compared to adjacency matrix. It shows that result gathered from this study conformed to the result obtained from the previous study on the application of transition matrix of FACS in explaining clinical waste incineration process. Hence, this study provides enrichment to the explanation of FACS through different type of matrix representation in describing any dynamical system.

ACKNOWLEDGEMENTS

IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

Alhamdulillah, praise be to Allah swt for giving me enough time and strength to complete this study successfully. I am able to complete this research with my full effort and within the time constraint given to me.

First and foremost, I would like to address my deepest appreciation and sincerest thanks to my dedicated supervisor Dr. Sumarni Abu Bakar and co-supervisor Prof. Dr. Razidah Ismail for their invaluable guidance, encouragement and constructive criticism that I had been receiving for the preparation of this research and advice that give me the strength to complete this study.

To all lecturers in the Faculty of Computer and Mathematical Sciences, thanks for their dedication, efforts and support in sharing valuable knowledge. I do feel most fortunate to have their expert guidance, precious advice and suggestion at every step of my research. Love and warmest thank to my dearest husband and parent, Mohd Afizul Bin Yajid, Hj Hashim Bin Zakaria and Hamidah Binti Ismail for their prayers, supports and encouragements throughout my educational years. Finally, to all those who have assisted me throughout the duration of this research, families, lecturers and friends, thank you to all of you. All of you have been a source of confidence and inspiration to me.

Thank you very much.

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